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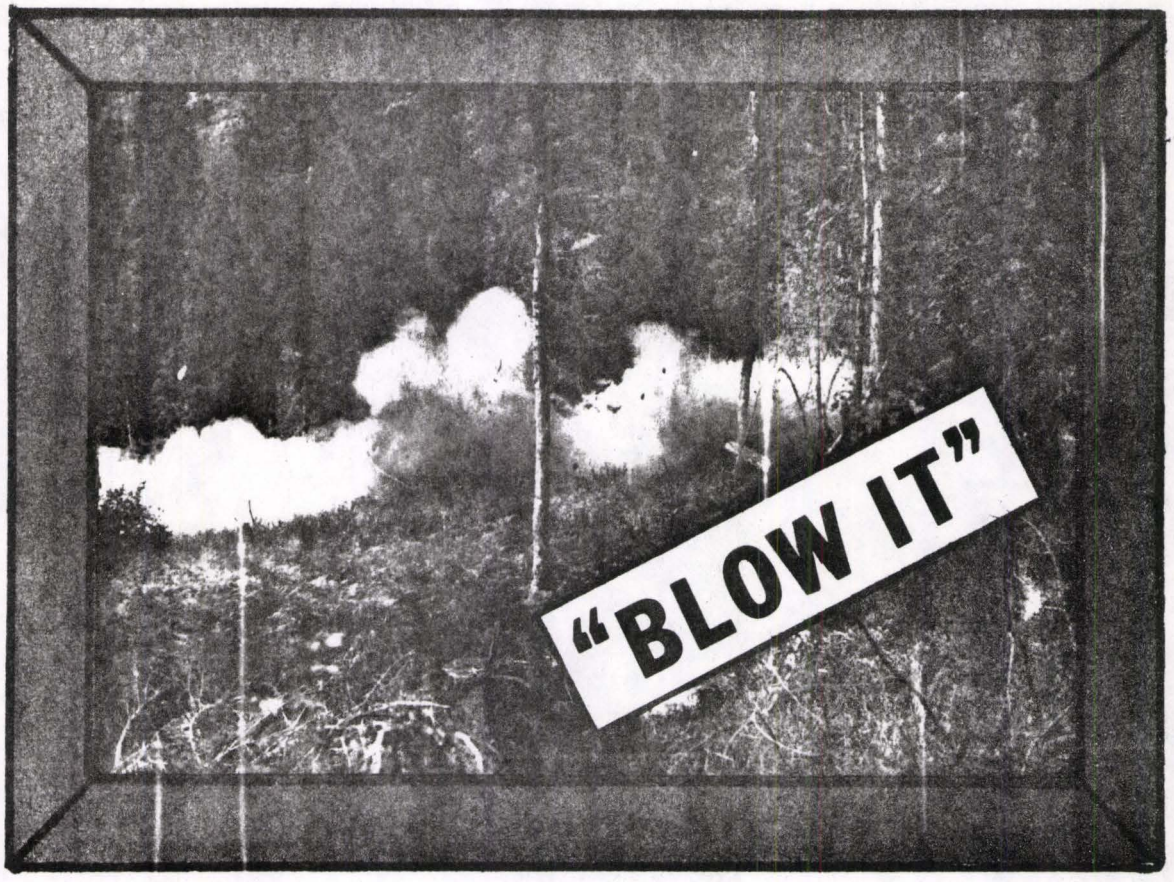
NEED A FIRELINE?



YOU CAN'T AFFORD NOT TO

CHUCK PETERSEN
FIRE MANAGEMENT TECHNICIAN
CANYON RANGER DISTRICT
CLEARWATER NATIONAL FOREST

In mid-September 1974, a specially trained team of smokejumpers from the Missoula Smokejumpers Base, under the direction of C.L. (Bud) Clark, parachuted to the Outlaw Fire in the Idaho Panhandle National Forest to determine the feasibility of constructing firelines safely and rapidly with explosives. This was one step of many in the development of a linear fireline explosive system which had begun about five years earlier in the Missoula Equipment Development Center.

The results of the Outlaw Fire operation revealed the use of explosives for fireline construction had several advantages over conventional fireline construction methods and justified the continued experimental use of the linear explosive system.

The results of the Outlaw Fire operation along with other information obtained on the linear explosives system indicated to Harry Cummings, Fire Management Officer on the Canyon District of the Clearwater National Forest, that this system might have an application on the District; not only for line construction on wildfires, but more importantly in the preparation of control lines on units planned for prescribed burning.

Logging operations require the construction of several thousand feet of control lines each season, often on slopes in excess of 35%. The line construction demands during the

relatively short field season on slopes not suitable for heavy equipment and in roadless helicopter sale areas combined with the approximate cost of $3.50 per foot for handline construction defined the need for a better method. The use of explosives showed potential to meet this need.

Cummings, already a certified blaster, required only a limited amount of training to become qualified in the use of fireline explosives and with the assistance of Rob Lundgren, Fuel Management Technician, and Chuck Petersen, Fire Management Technician, the experimental explosives program was under way.

In September of 1975; 6,000 feet of line explosives was purchased from the E.I. DuPont Co. and 6,000 feet from IRECO Chemicals. Both companies use a different line jacket covering and the order was split to determine which covering was most suitable.

The DuPont product is a cap sensitive gel, Class A fireline explosive with ½ pound of explosive material per linear foot. Approximate diameter of the explosive is one inch with a minimum tensile strength of 300 pounds per foot for the polyethelene jacket. The 100 foot lengths of explosives are accordian folded in a cardboard container weighing approximately 55 pounds to allow for continuous deployment while walking. At the time of purchase the price of the DuPont Product was $.50 per foot.

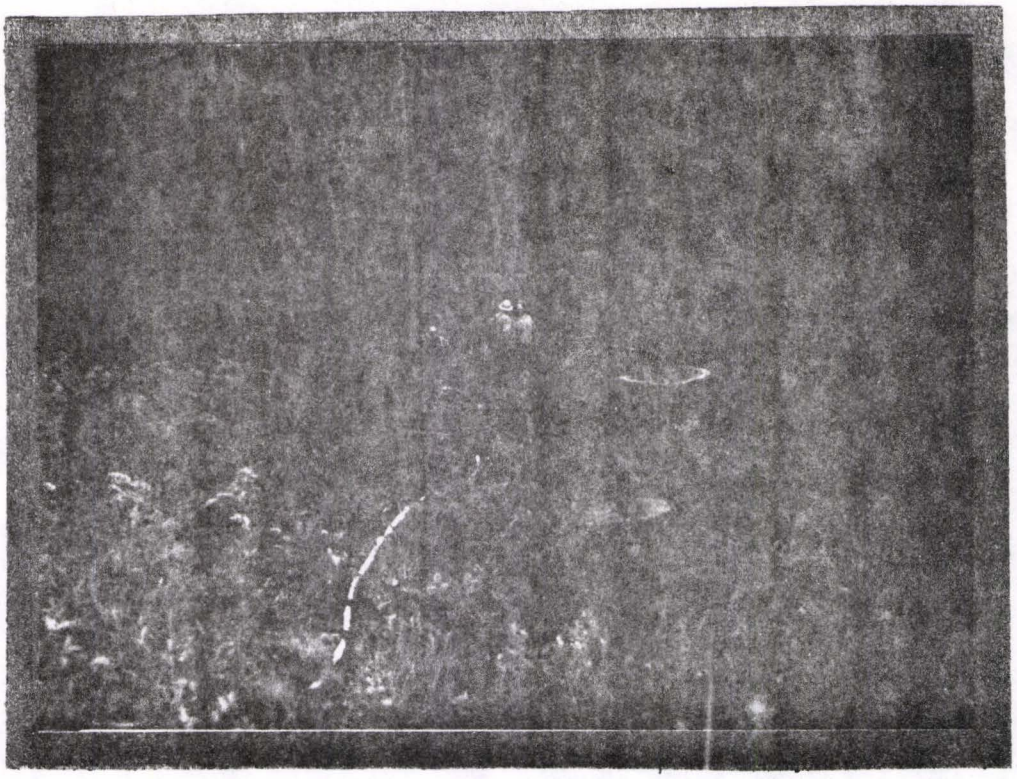


Photo shows fuel condition prior to explosive line construction

Photo shows nearly 100% line completion following detonation.

The IRECO Chemicals product was similar to the DuPont product except lengths are coiled on a removable spool in the cardboard container. Also the lighter weight polyethelene jacket is covered with a braided nylon outer protective sleeve, resulting in a price of $.76 per foot.

Both DuPont and IRECO products differ from the explosives used on the Outlaw Fire project in the fact they do not contain the retardant cooling salts to prevent fire starts. The absence of the cooling salts greatly reduces the cost per foot of the explosive, but generally limits the use of the product to periods with high fine fuel moisture.

During late summer and early fall of the 1976 field season, actual line building began with the explosives. Approximately 9,000 feet of the line explosives was used during this period mostly on roadless clearcuts in one of the District's helicopter logged sale areas. These small 4 to 15 acre units were designed to enhance big game winter range and large fuels had been yarded back one chain from the planned control lines by helicopter prior to line construction. The explosive line construction was also used to a lesser extent during actual burning operations on units too large to complete during one day. Explosives were used to build control lines on ridges and areas of lighter fuels to allow burning the units in sections. At one point a burning log rolled into and ignited a section of a unit planned for burning a few days later.

This occurred during mid-afternoon on a day with a High (17) Burning Index. The high burning index combined with erratic wind conditions caused a high rate of spread in approximately 130 tons per acre of slash. The rapidly spreading fire combined with the lack of available manpower to build handline posed an extreme escape potential. In a relatively short time, 400 feet of line explosives was positioned approximately 100 feet ahead of the advancing fire, detonated and the spreading fire was contained by the available manpower with a minor amount of difficulty. Despite the dry weather and fuel moisture conditions; the detonation of the explosives, without the retardant cooling salts, did not cause a separate fire.

The best control lines to burn against were achieved when the lines were blown as near the planned time of burn as possible.

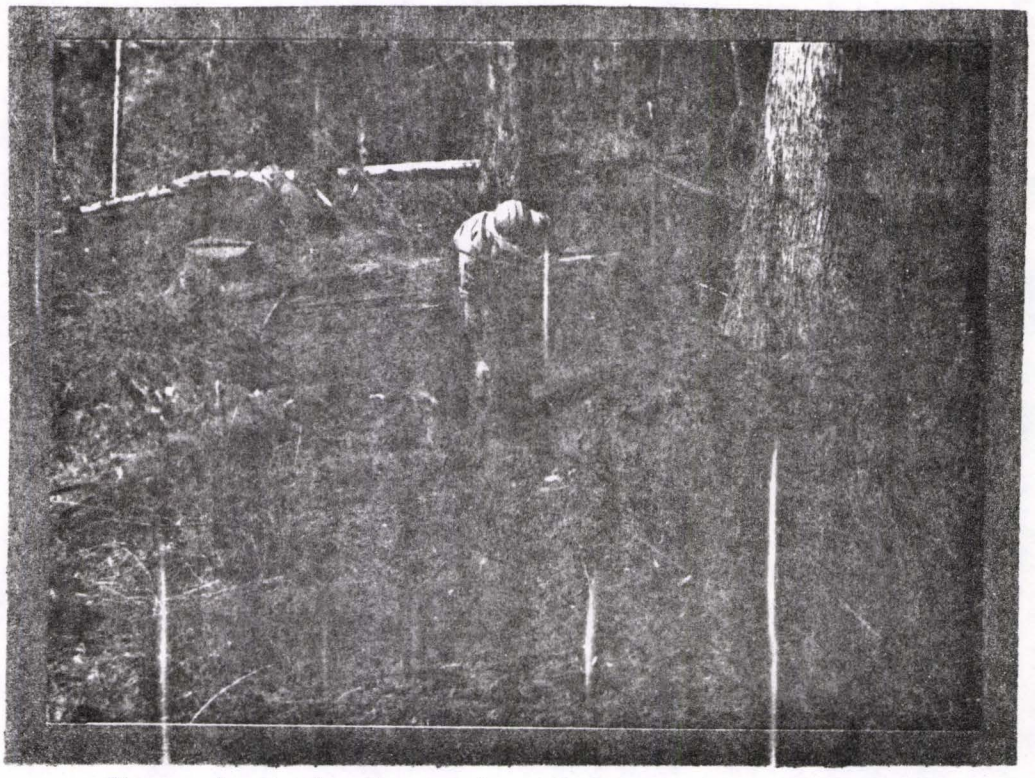


Photo shows the feathering of soil material on adjacent fuel just after the line was blown

The exploding material shrouds and imbeds soil particles on and into fuel for approximately six feet on either side of the line. The feathered soil reduces fire intensity on the burning side of the line and greatly decreases the spotting on the outside of the line.

Photo shows completed burn against line pictured on the previous page. As the fire burned up to this line, the intensity was low and spotting outside the line was not a problem.

Some problems were encountered with the DuPont product; one of which was the accordian fold packaging procedure which caused the explosive material to separate at each fold. This reduced the propagation capabilities of each 100 foot length and often required several detonations to achieve a completed line. The District developed an apparatus to squeeze the explosive material together at each fold after the length

was positioned. This reduced the number of incomplete propagations, but required more time to ready several hundred feet for detonation. Also the components of the explosive material in the DuPont product seemed to break down very rapidly after six months of storage causing it to seep through the polyethelene covering creating a needlessly hazardous and messy condition. These problems were not encountered in the IRECO product.

The packaging for continuous deployment was found unnecessary for our needs. A more complete line was achieved if each length was removed from the package and pulled into position by one end. This allowed positioning the length of explosive under logs and debris which resulted in a much higher line completion percentage. The explosive line needs to be coiled in crush-proof containers, but not necessarily on a removable spool as in the case of the IRECO product.

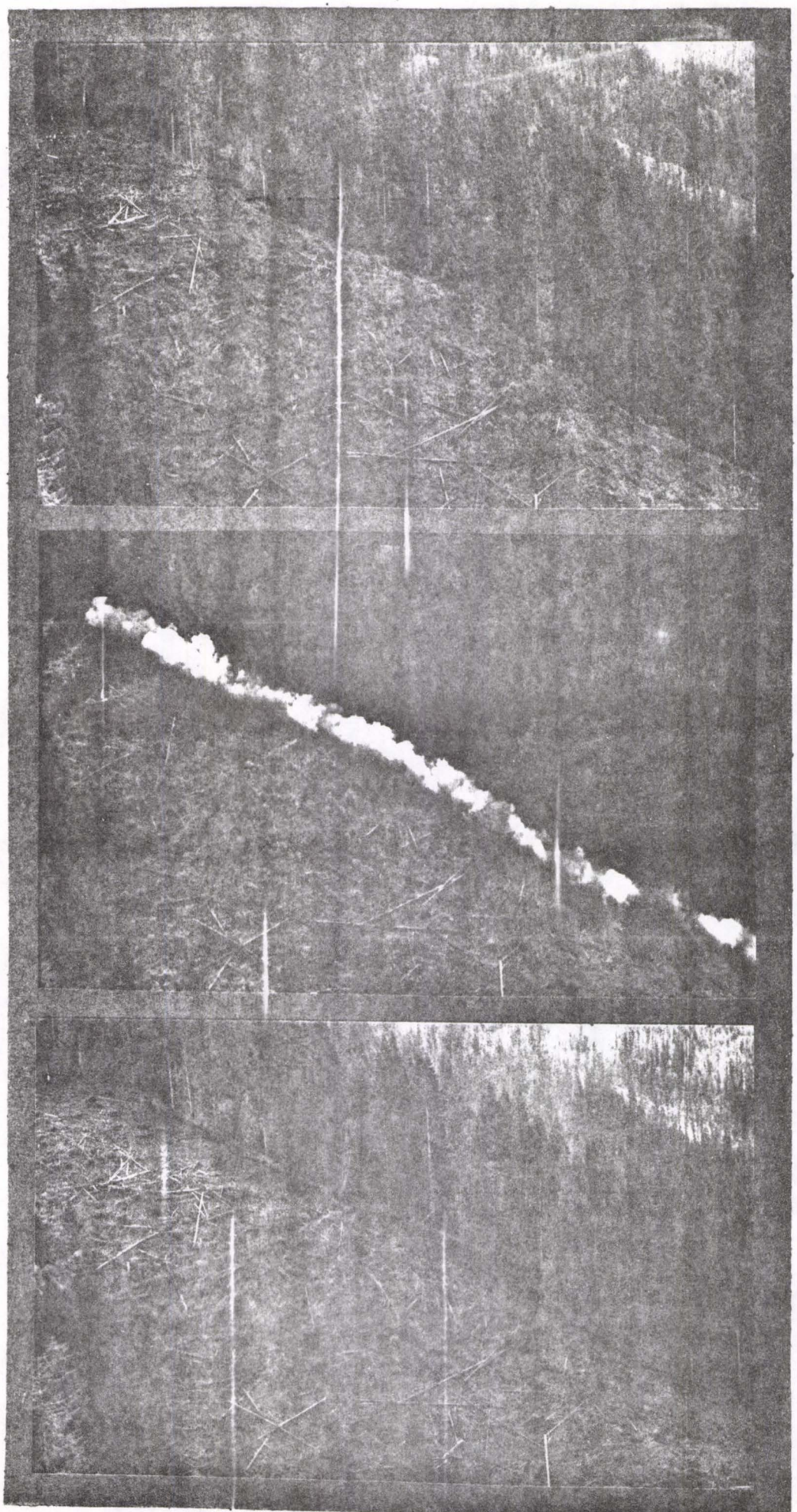
In analyzing the explosive material coverings of the two products, it was determined the 6 mil. polyethelene jacket on the DuPont product was very satisfactory. The extra strength of the braided nylon outer protective sleeve on the IRECO product was not necessary for deployment protection and did not justify the extra expense.

The Class C Exploding Bridgewire (EBW) detonating fuse was and will continue to be used on similar line building projects on the District. The EBW detonator requires a precisely

timed electrical charge from a portable Exploding Bridgewire Firing Set which eliminates the possibility of accidental detonation. This firing system allows the use of radios on line construction operations to maintain safety clearances when detonating several hundred feet at one time. Use of the EBW detonator at approximately $4.00 each is substantially more expensive than standard blasting caps, but the increased safety factor more than justifies the added cost.

Since most of the line construction using explosives was done on helicopter logged clearcuts on which the larger fuels had been yarded away from the boundaries by helicopter; our average cost of $1.10 per foot of completed line may be somewhat lower than could be expected on areas where heavy fuels are immediately adjacent to the line. The limited amount of explosive construction done in unyarded areas would indicate an approximate cost of $2.00 per foot of completed line; substantially lower than conventional handline construction costs in the area.

The overall performance of the linear explosive system was highly successful. This highly safe, relatively low cost, quick and very effective line construction system has proven its worth on the Canyon District.



Explosive line in position.

Detonation

Finished line.

Photos show conditions before and after use of fireline explosives.